(c) Remarks

First, in our telephone conversation of 11/4/04 it was my recollection and intention to make the election with traverse, rather than without as stated in the office action.

Next, it is noted that in *Sogo*, although the inorganic filler is added to the blend at the beginning of the manufacturing process, the filler is extracted at the end of the process, so that almost no filler is present in the final membrane. "Subsequently, the extraction of the inorganic particles is conducted by the use of a solvent for the inorganic particles." 8:8-9. Further, "After the extraction of the organic liquid and the inorganic particles, the resultant microporous film may still contain some organic liquid and inorganic particles, which is acceptable, as long as the remaining materials do not impair the desired properties of the microporous film. * * * The acceptable residual amount of the inorganic particles in the microporous film is 3% by weight or less, preferably 2% by weight or less, based on the weight of the microporous film." 8:28-39.

Thus, the percentage of inorganic material in Sogo is less than 3%, while in the present application the percentage is between 5% and 30%. See claims 23-25.

In *Samii '379* the inorganic material at the end of the process is about 95%, as noted by the Examiner, in contrast to the 5%-30% of the present invention.

Nagou also notes the need to remove the filler: "The preparation of a porous film has been tried by incorporating a filler having a small particle size into polypropylene, forming a film by melt molding and extracting the filler from the film. This process, however, is defective in that if a large amount of the filler is incorporated in order to increase the porosity, because of secondary aggregation of the filler it is difficult to form

a uniform porous structure, or the extraction efficiency is low and the porosity is insufficient." 1:18-26. The removal of the filler is discussed in various places in the disclosure (See 5:37 et seq., 28:63 et seq.), but *Nagou* does not specify how much filler is left in the final membrane, and only indicates the amounts used in the initial mixture before processing. (See *Nagou* claims 12, 13).

Next, it has been noted that the composition of the material in the present invention, as amended, is different from the prior art. But it should be further noted that the membrane's composition in the present invention is so constructed to serve a different function from the prior art, thus traversing any obviousness objections for the reasons discussed *infra*. In the present invention the retention of TiO_2 in the membrane serves the function of facilitating shutdown when the temperature rises to a dangerous level. In all of the prior art cited, the TiO_2 facilitates the formation of pores in the membrane.

A. Claims Are Not Taught by References Under § 102

Note first that Claim 23 is an amended form of claims 1 and 2 combined, wherein the percentages of the components have been adjusted. The percentage of TiO_2 in the amended claims is now 5%-30%, in accordance with the disclosure. Note example 1 discloses a mixture containing 3 parts by weight TiO_2 in a total mixture of 25 parts by weight. Liquid paraffin was added, but subsequently extracted at the end of the manufacturing process. Thus, the TiO_2 represents 3/25 of the final material, or 12% by weight.

A similar analysis of the other examples shows the range cited in claims 23-25.

Neither *Sogo* nor *Nagou* nor the *Samii '379* patent discloses or teaches the membranes of claim 23 of the current invention. To constitute prior art for the purposes

of anticipation, a reference must teach each and every element of the claimed invention, arranged as in the claim. Lindemann Machinenfabrik GmbH v. American Hoist & Derrick Co., 730 F.2d 1452, 221 USPQ 481, 485 (Fed. Cir. 1984) (citing Connell v. Sears, Roebuck & Co., 722 Fed.2d. 1542, 220 USPQ 193 (Fed. Cir. 1983).

The ranges of elements in the present membrane are patentably different from those of each of the references cited by the Examiner, and it is those differences which cause the unexpected result of providing high melt integrity and shutdown capability, which are the object of the present invention, providing important safety features thereby.

B. The Mineral Filler in the Three Prior Art References is Used for Purposes Different from the Present Invention..

In *Samii (*US 6,372,379) and *Sogo* (US 5,641,565) a metal oxide filler is used. In *Nagou* (US 4,791,144) a mineral filler (Silica) is mixed in the original compound. In *Nagou* and *Sogo* the filler is used to cause holes to form when the compound cures, and the filler is then removed to leave the holes, so that the material is porous.

In *Samii '379* more than 90% of TiO_2 filler remains in the membrane in order to absorb large amounts of oil used in the processing, which will be removed at the end of processing, thus creating the pores in the membrane.

When silica is used as a filler KOH is used to dissolve it after extrusion. When TiO_2 is used sulfuric acid is used to dissolve it. In either case the processes described in *Sogo* and *Nagou* attempt to remove as much filler as possible, but do not remove all, although complete removal would be acceptable, or even preferable in these prior art inventions.

In the current application, in contrast, a controlled amount of TiO_2 filler is left, which creates the properties desired in the membrane. In contrast the prior art references used the filler only to create the pores or holes, after which the filler was removed.

The TiO_2 filler in the present invention is used for the purpose of establishing and controlling the shutdown properties of the invention. Shutdown occurs when the pores of the membrane are melted shut, so that no further migration of ions between the cathode and anode is possible. The shutdown must occur without compromising the integrity of the membrane itself. That is, the membrane must not begin to disintegrate prior to the closing of the pores, since such disintegration would cause catastrophic failure of the battery, including possible explosion.

To illustrate the problem further, the melt integrity of a membrane containing a high or ultra-high molecular weight polymer and TiO_2 is shown in the following table:

% TiO_2	Temp of Disintegration - deg C
0	135
10	140
90	>200

At 90% TiO_2 the membrane never shuts down, and the temperature of disintegration is likewise quite high, but runaway is still possible. To create a membrane which shuts down at a reasonable temperature, and still maintains its integrity far beyond the shutdown temperature, it has been found that the percentage of TiO_2 filler must be maintained within the range of Claim 23, provided that the high molecular-weight polymer of claim 23 is also included. The above table illustrates that the temperature of disintegration for low concentrations of TiO_2 still provides a relatively safe membrane,

provided that the membrane shuts down at a substantially lower temperature than the disintegration temperature.

Claim 23 claims such a combination of concentrations. The prior art references cited by the Examiner do not.

As a result of the arguments presented above, it is believed that the rejections based on 35 USC § 102 must fail.

C. The References Do Not Suggest the Combination of Elements Under § 103

Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching suggestion or incentive supporting the combination. *In re Greiger*, 2 USPQ.2d 1276, 1278 (Fed. Cir. 1987). "When the incentive to combine the teachings of the references is not readily apparent, it is the duty of the examiner to explain why this combination of reference teachings is proper *** Absent such reasons or incentives, the teachings are not combinable." *Ex parte Skinner*, 2 USPQ.2d 1788, 1790 (BPAI 1987).

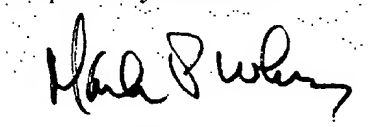
Neither *Sogo* nor *Nagou* nor *Samii '379* are reasonably pertinent to the problem with which the inventor was involved. To provide an incentive to combine teachings of references for the purpose of showing obviousness, the references must all be pertinent to the problem which the current invention is intended to solve. *In re Deminski*, 230 USPQ 313, 315. As previously stated, the purpose of the current invention is to provide a battery separator membrane with not only low electrical resistance and a very small pore size, but to provide such membrane with a high melt integrity and a shutdown temperature substantially below the temperature at which the membrane begins to

disintegrate. None of the prior art relates to the shutdown temperature/melt integrity function. As a result, these references cannot be reasonably combined to provide a valid rejection in accordance with 35 USC § 103.

For the foregoing reasons, the Applicant submits that the Shutdown Separator with Improved Properties as disclosed and claimed in the present application is not fairly taught by any of the references of record, either taken alone or in combination. Therefore, allowance of the present application is in order, and is requested.

The Commissioner is hereby authorized to charge any additional fees do to my deposit account No. 231706.

Respectfully submitted



Mark P. White, Registration No. 37,757
MPW/ag

CERTIFICATE OF FAX SERVICE

I hereby certify that this correspondence is being transmitted, by FAX, addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231 on the date shown below, and to the FAX number shown below.

Addressee FAX number 703-872-9306

Addressee USPTO, Box Amendments

signed and transmitted on: February 8, 2005

by _____

Mark P. White